Google LLC
25 Massachusetts Avenue NW
Ninth Floor
Washington, DC 20001

202-346-1100 main
google.com

February 13, 2018

Via Electronic Filing

Marlene H. Dortch
Secretary
Federal Communications Commission
445 Twelfth Street SW
Washington, DC 20554

Re: ***Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz (GN Docket No. 17-183)***

Dear Ms. Dortch:

On February 12, 2018, Andrew Clegg, Caitlin Mori, Michael Purdy, and I met with Donald Stockdale, Peter Daronco, Tom Derenge, Ariel Diamond, Matthew Pearl, Paul Powell, Rebecca Schwartz, Blaise Scinto, Stephen Buenzow (via phone), and Dana Shaffer (via phone) of the Wireless Telecommunications Bureau; Julius Knapp, Bahman Badipour, Brian Butler, Michael Ha, Nicholas Oros, Barbara Pavon, and Jamison Prime of the Office of Engineering and Technology; and Jose Albuquerque and James Schlichting (via phone) of the International Bureau. During the meeting we discussed the points summarized in the attached presentation regarding the need to update earth station registration information in the Commission's IBFS database, the potential for expansion of the fixed service in the lower C-band (3.7–4.2 GHz) to meet demand for consumer broadband, and paths to authorizing mobile use of lower C-band spectrum.

This notice is being filed in the above-referenced docket for inclusion in the public record. Please contact me should you have any questions.

Respectfully submitted,

Austin C. Schlick
Director, Communications Law
Google LLC

cc: *Via electronic mail*
Meeting participants

Google

Opportunities for Broadband in the Lower C-band (3.7–4.2 GHz)

GN Docket No. 17-183

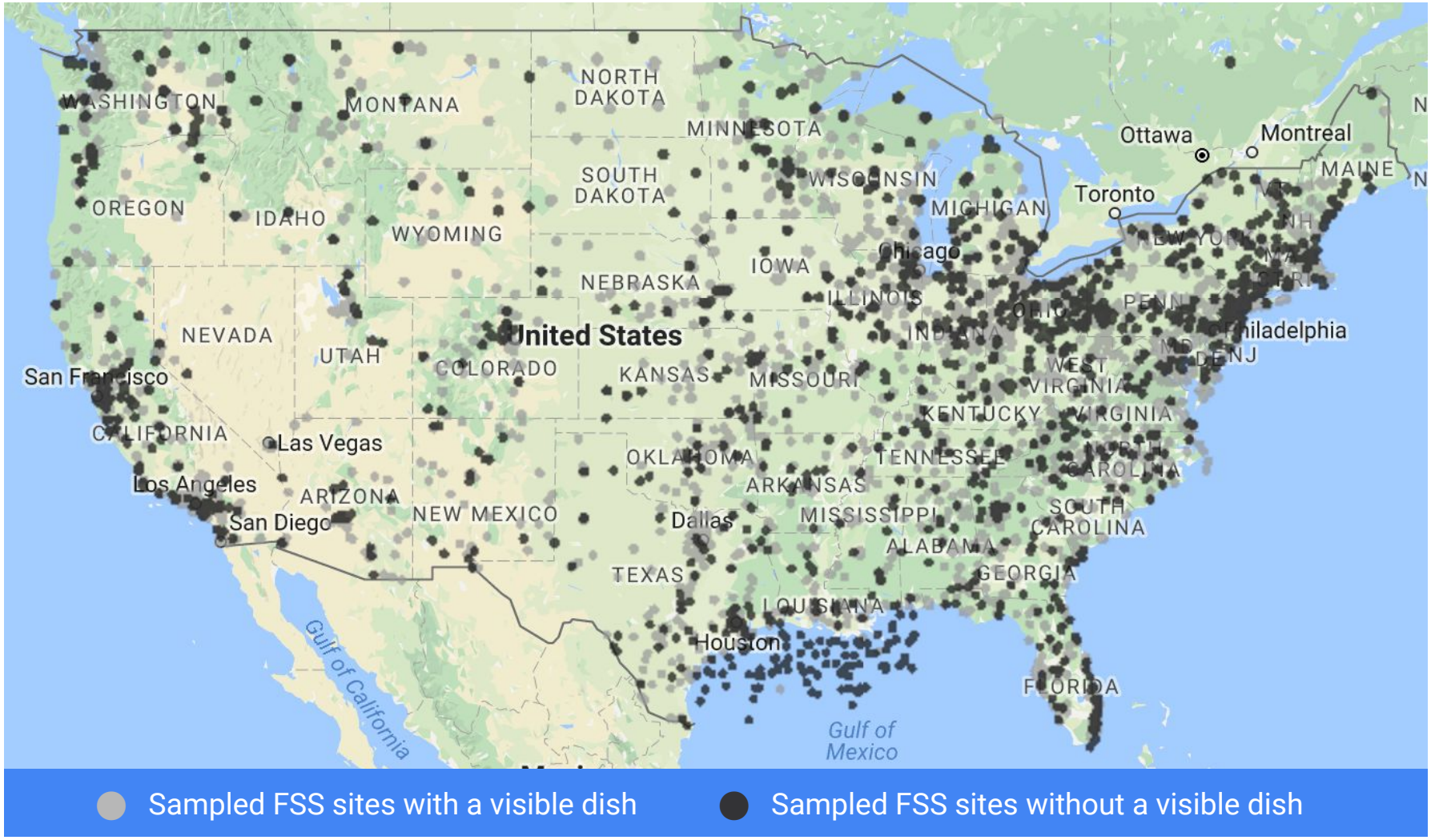
February 12, 2018

Path to efficient utilization of the lower C-band:

1. Clean up IBFS database to reliably catalog all incumbents entitled to protection (Public Notice)
2. Revise Part 101 technical rules to allow shorter-range P2P and P2MP fixed links with automated coordination (NPRM)
3. Explore options for mobile entry (NPRM)

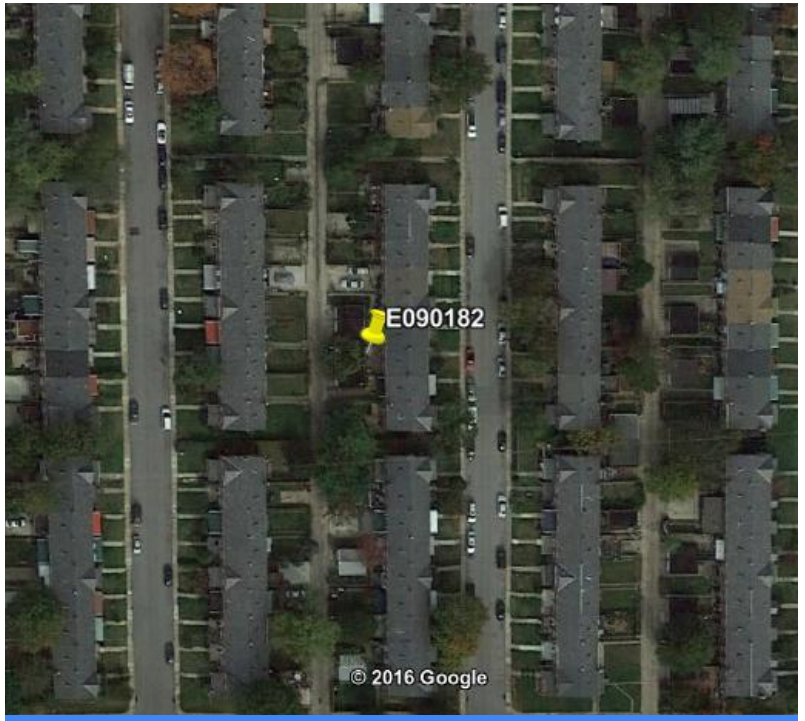
1. Clean up the IBFS database

Satellite imagery reveals that many earth station registrations are incorrect or outdated



Unregistered or incorrectly registered dishes are not entitled to protection

- Form 312 applicants must provide “true, complete, and correct” registration information, and keep filed information current
- 47 CFR § 25.162 provides for "termination" of protection if earth station is inactive or operating inconsistent with its registration



Example: License E090182, providing for a 16-foot diameter C-band earth station dish, corresponds to the backyard of a home in a densely-populated residential neighborhood of Baltimore. No dish is apparent.

IBFS data should be updated to protect actual earth stations—but not phantom registrations

- Public Notice encouraging all operators of receiving earth stations in the lower C-band to review and update w/in 90 days:
  - Registration status of all operational stations
  - Operational status of all registered stations
  - Location coordinates
  - Operational parameters (frequencies and orbital locations actively used at the time)
- Updates have been required of other licensees including FSS earth stations in/adjacent to the CBRS band[1] and PLMRS, MDS, MMDS, and ITFS licensees[2]
- Announce strict enforcement of Rule 25.162: Permanent loss of protection for the registered location(s)
- Separately commence proceeding on limiting full band/full arc registration and streamlining station registration process
  - Should not delay IBFS update or Part 101 reforms

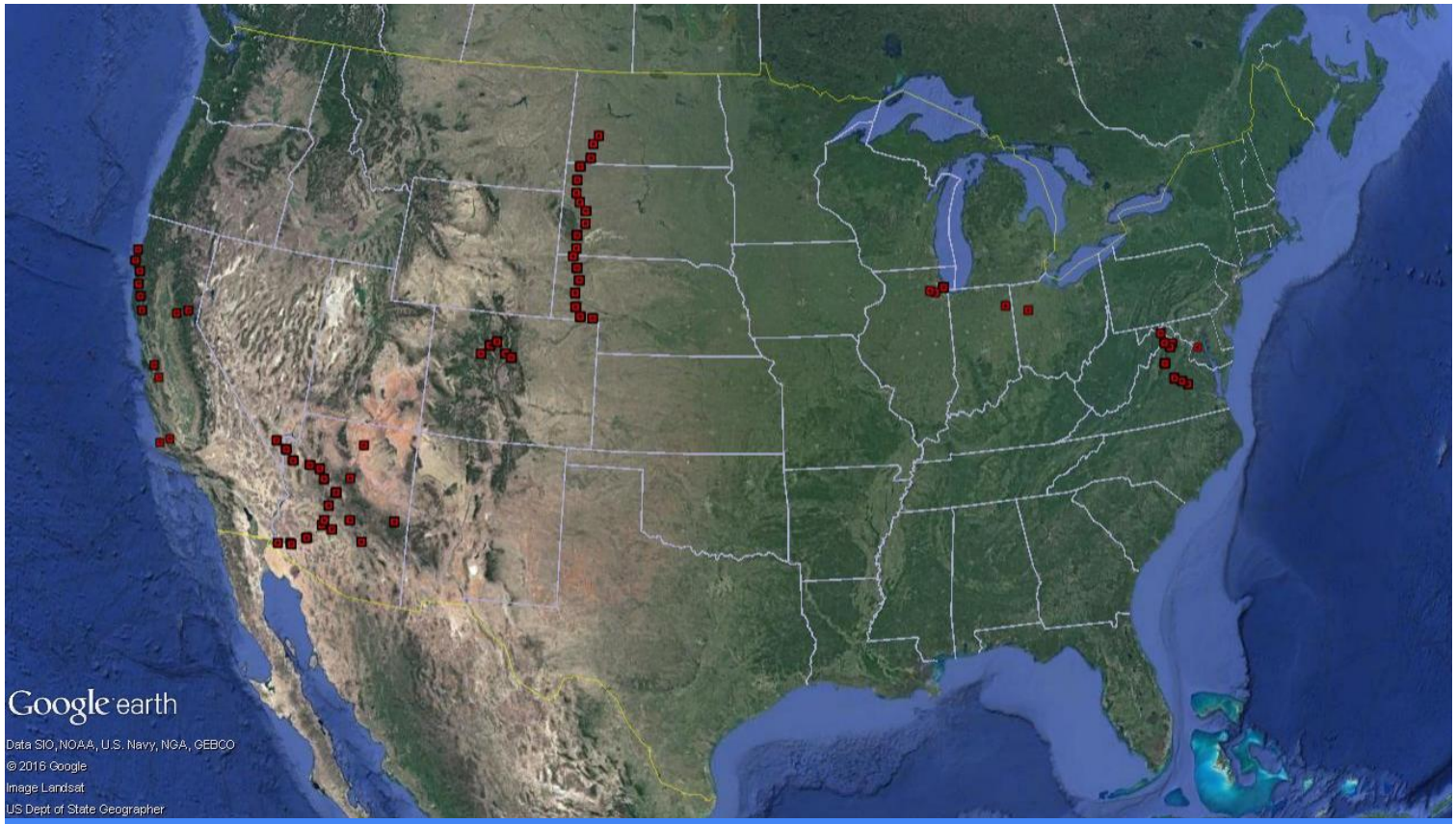
[1] *Wireless Telecommunications Bureau, Office of Engineering and Technology, and International Bureau Announce Procedures for Registration of Fixed Satellite Service Earth Stations Entitled to Protection from the 3.5 GHz Citizens Broadband Radio Service*, Public Notice, 32 FCC Rcd. 10419 (2017).

[2] *Wireless Telecommunications Bureau Announces Final Phase of the Private Land Mobile Radio Station Construction and Operational Status Audit*, Public Notice, 19 FCC Rcd. 2107 (2004); *Wireless Telecommunications Bureau Seeks to Verify ITFS, MDS and MMDS License Status and Pending Applications*, Public Notice, 17 FCC Rcd. 20538 (2002).

2. Revise Part 101 to enable additional P2P and P2MP links with automated coordination

The lower C-band is underutilized

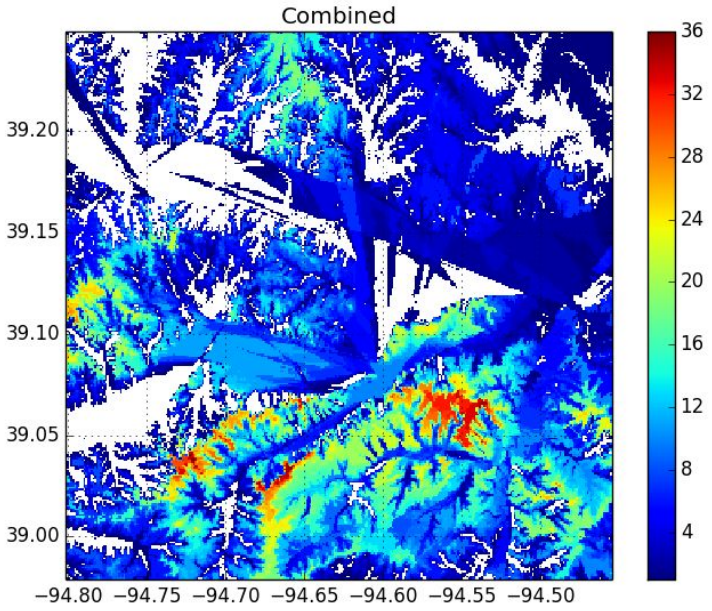
- 500 MHz of available spectrum
- Current Part 101 rules prevent extensive use by the Fixed Service
  - P2MP links not allowed
  - Technical requirements inappropriate for consumer broadband



Fixed Service Licensees (2016 registrations)

Lower-power FS services can coexist with FSS operations

- Low-power “last-mile” broadband distribution using ~1–50 W EIRP P2P/P2MP connections
- Careful beam positioning
- Located in clutter, adding 40–60 dB of isolation
- Concentrate on suburban areas, which have the lowest occurrence of FSS sites
- Hypothetical example:
  - 17% of Kansas City metro area can support fixed P2MP Service at 3.7 GHz
  - 50 dBm, 10 m AGL, 45 deg beam
  - Near worst-case prop model (ITM)



Mechanism for interference avoidance

Basic principle: Avoid pointing FS beams toward the known locations of nearby protected FSS earth stations

- Updated IBFS will provide complete information on incumbent earth stations w/in 150 km that are entitled to protection
- Both FS and FSS sites are fixed, known, verifiable, and rarely change (unlike, e.g., mobile and 3.5 GHz incumbent radars)
- Non-interference can be facilitated through a cloud-based Coordination System (CS) that utilizes data from IBFS

Automated coordination process

1. Candidate FS network (P2P or P2MP) provides terminal locations, height, bandwidth, power level, and antenna information to the CS
2. Using IBFS data, the CS determines aggregate signal strength from existing FS systems and
    a. CS provides the candidate network a maximum allowable EIRP to avoid interference, or
    b. CS denies the request
3. FS network acknowledges the permission or revises its request
4. FS network may add terminals through same process
5. FS network periodically queries CS for relevant updates to IBFS registrations

Part 101 updates to enable robust FS use

Regulatory

- ➔ Authorize P2MP links (§ 101.101)
- ➔ Remove throughput utilization requirements (§ 101.141(a)(3)(ii))
- ➔ Adopt location requirement similar to Part 96 (§ 101.103(d)(2)(ii))
- ➔ Exempt low-power devices from equipment access prohibition (§ 101.131(a))

Technical

- ➔ Update power limits for broadband applications (§ 101.143(b))
- ➔ Revise antenna requirements to allow broader beamwidth, lower gain (§ 101.115)
- ➔ Allow TDD channels and channel aggregation (§ 101.147(h))
- ➔ Update coordination rules (§ 101.103(d)(2)(v)(C)) to allow for automated admissions control

3. Explore paths to mobile entry

Potential paths to mobile entry in the lower C-band

- The Commission should seek public comment on approaches including:
  - Repacking FS and FSS into a portion of the band and allocating the cleared spectrum for mobile
  - Voluntary agreements between mobile and FSS operators[1]
  - Database-managed sharing
  - Relocating FSS operations to other satellite bands[2]
  - Assigning FSS operations to defined geographical areas where they would be less likely to receive harmful interference[3]
- Amending Rule 101.103 to require that all new FS devices in the lower C-band operate across the full 500 MHz will facilitate flexible-use solutions

[1] *See* Joint Comments of Intelsat License LLC and Intel Corporation in GN Docket No. 17-183 at 3 (filed Oct. 2, 2017).
[2] *See* Comments of CTIA in GN Docket No. 17-183 at 10-11 (filed Oct. 2, 2017).
[3] *See* Comments of T-Mobile USA, Inc. in GN Docket No. 17-183 at 14 (filed Oct. 2, 2017).